

2nd 80s Fire

Decanting Plan

03/27/2019

Approval:

Position	Name	Signature	Date
Environmental Unit Lead			
Planning Section Chief			
Incident Commander			
FOSC			
SOSC			
LOSC			

1.0 DEFINITION AND PURPOSE

This Decanting Plan was prepared on behalf of the Environmental Unit (EU) supporting Unified Command (UC) to outline the general approach, procedures and considerations that will guide decanting operations, if in the course of recovery operations, it becomes necessary to drain off recovered water in order to increase the available capacity for additional recovered product.

Decanting is the process of draining off recovered water. For the purposes of this plan decanting will only be considered from an on-water storage barge or OSRV (Oil Spill Recovery Vessel) into which smaller response vessels may lighter recovered product/water mixture into.

Based on a technical and toxicological review of the physical and chemical properties for products involved in the fire (e.g., Pyrolysis Gasoline, Xylene, Toluene, Naphtha, and Base Product), and response activities (e.g., fighting foam), as found on the Safety Data Sheets (SDSs), in conjunction with analytical data obtained during sample analysis from the breeched secondary containment structure, it is the recommendation of the EU that decanting from a centrally located on-water storage barge be permitted as a means to increase on-water storage capacity from individual on-water response vessels during recovery operations.

Copies of the SDSs for the above products can be found in **Waste Management Plan**.

The inability to decant water from recovered product/water mixtures and return the excess water into the recovery area significantly reduces the volume of available temporary storage capacity, thus reducing the effectiveness of the on-water skimming and recovery operations. The inability to return the excess water will delay recovery operations and possibly lead to a complete cessation of recovery operations until additional temporary storage can be arranged.

Alternatives to decanting from a storage barge/ OSRV as a means to increase storage capacity were considered for this incident but were ultimately excluded after careful consideration for the following reasons:

1. Intercontinental Terminals Company – Deer Park facility has onsite storage capacity to receive the recovered product/water mixture from the response vessels; however, each of the docks where the response vessels would need to berth for offloading is presently located in the Hot Zone and is unavailable for safety reasons.
2. Vacuum trucks located at off-site receiving facilities can receive the product/water mixture; however, the transit time for vessel to reach the approved offsite offloading locations, as well as the time and resources that would be needed to remove all liquids from a large capacity vessel would severely limit the amount of time during which on-water recovery could continue.

2.0 SAFETY CONSIDERATIONS

Safety is the most important consideration when implementing this plan. All site personnel will

review and adhere to the incident Site Safety and Control Plan (ICS Form 208) and company/contractor-specific Health and Safety Plans (HASPs), as applicable. Daily tailgate safety briefings will be conducted prior to going into the field. Additional safety briefings may be given prior to undertaking particular activities. Decanting will only be under weather or other environmental conditions that do not create unsafe working conditions, and the appropriate personal protective equipment (PPE) will be utilized for each task. Any incident will be promptly reported in accordance with the site-specific site safety plan and UC-objectives.

3.0 OPERATION

Due to the complexities of decanting, procedures are specific to each operator's own protocols and vessel's decanting equipment arrangement. Refer to the operator's decanting procedure as required.

4.0 DURATION

This decanting request and subsequent UC approval is being sought for all subsequent operations. There are a sufficient number of on-water recovery vessels presently resourced for this incident; however, in order to aggressively and efficiently recover product from the water, it is necessary to have on-water recovery vessels transfer recovered product/water mixture into an on-water storage barge or OSRV from which decanting, if necessary, can occur.

5.0 PRE-VAILING CONDITIONS

The pre-vailling weather conditions are updated throughout the operational periods and presented on the Situation Status display, Weather Report. Please consult this weather report prior to initiating decanting.

6.0 AUTHORIZATION

Although there is no pre-approval for decanting listed in the Central Texas Coastal Area Contingency Plan (CTCAC Plan), decanting will be considered on a case-by-case basis by UC.

Should decanting be authorized, it will only occur when it is essential to the continuing recovery of product and UC has determined that the net environmental damage will be minimized through this practice. The State's emergency authority to approve decanting in no way relieves regulated operators of the contingency plan requirements of relating to emergency storage capacity. In addition to decanting, some activities, such as those associated with product recovery vessels, small boats and equipment cleaning operations may result in incidental discharges. This Decanting Plan, will cover these activities which may be necessary to facilitate response operations on a continuing basis.

7.0 PROTECTIVE MEASURES AND ENVIRONMENTAL CONSIDERATIONS

The decanting operation will meet the following conditions:

1. Decanted waters must contain a lesser concentration of product contaminants, determined visually, than the product/water mixture being recovered.
2. **Decant water must be discharged into impacted waters or within the collection boom or area, vessel collection well, recovery belt, weir area, or directly in front of a recovery system.**
3. Vessels not equipped with a product/water separator must allow a specified retention time for product held in internal or portable tanks before decanting commences. Water to be decanted must be withdrawn a minimum of twelve inches below the product/water interface in any temporary storage tank.
4. Close control over the skimmer/discharge system must be continually maintained by operating personnel to prevent discharge of concentrated products.
5. ITC representatives shall record all decanting operations including location of the decanting, time decanting started, time decanting stopped, and decanting pump rates.
6. If required USCG shall have access to the decanting operation for the purpose of evaluating its effectiveness and to collect samples or conduct real-time monitoring to the SMART Tier 2 protocols (e.g., using fluorometry).
7. Sampling of the effluent from the decanting process may be conducted periodically from each vessel conducting decanting to document the concentration of any product constituents re-entering the water as a result of this process. Sampling will be conducted in accordance with the Surface Water Sampling, Product, and Foam Sampling Plan prepared for this response and circulated for UC approval. Data will be managed in accordance with the Data Management Plan prepared for this response and being circulated for UC approval.

Supplemental Information

Behavior

Decanting takes advantage of the properties of water and the products involved in the incident to partially phase separate under calm conditions. Products involved in this incident have a lower specific gravity than water and consequently floats on top of the water. This allows the less contaminated water below the product “rag layer” to be extracted from the storage tank to increase the room available for storing more recovered product.

Decanted water is not pure, but it is substantially less contaminated than the original product-water mixture pumped into the initial storage tank. When first pumped into a storage tank from the recovery point (a skimming head, for example), the product and water are subjected to high mixing energy as it passes through the pump. The mixing energy of the pump can generate water-product emulsions and can also break some of the product into very small droplets. Both the creation of an emulsion and the smaller droplet sizes can slow the product-water separation process in the tank. The smaller product droplets take longer to refloat to the surface of the tank because they are less buoyant than larger droplets. In addition, the increased surface area of the smaller droplets (as compared to that of larger droplets) suspended in the water layer allows for greater exposure of the water layer to the small fraction of the product that is water soluble. These can include toluene, ethyl benzene, benzene and xylene. It should also be noted that the increased surface area of the smaller droplets at both the surface of the tank and in the decanted water stream allow for greater evaporation of the aromatics to the atmosphere.

The level of contamination found in the decanted water can be reduced by increasing the time allowed for the separation of the product and water phases either in the initial storage tank or in secondary storage. Settling time and decanting methodology will need to be determined on a case-by-case basis to minimize the degree of recontamination from the decanting discharge.

Spill Impact Mitigation Analysis (SIMA)

Considering the Spill Impact Mitigation Analysis (SIMA) determination regarding decanting assumes that storage of recovered product-water is a limiting factor. Containing and removing free floating product reduces the potential environmental impacts that would otherwise occur were it not contained and removed. Halting recovery operations raises the potential for contained product to escape and for uncontained product to continue moving through and impacting the environment. Decanting provides a net environmental benefit when compared with not decanting because it allows for the continuation of recovery operations.

Often, the concern about decanting focuses on the re-introduction of slightly contaminated decanted water to the environment. Decanted water will be discharged into water that is already contaminated or into the point where the product-water mixture was originally recovered (such as in the containment boom). If recovery operations halt because of storage limitations, the water column will continue to be exposed to the water-soluble components of the contained product until it is removed from the water surface. In short, by allowing the reintroduction of the trace amounts of product found in the decanted water, the highest rate of removal of a greater source of contamination (i.e., the contained, free floating product) can be realized, thus providing a net environmental benefit.

Resources at Risk from Decanting in the Houston Ship Channel

In general, it is unlikely that the small amount of hydrocarbon present in the decanted water would represent any additional threat to those species present beyond that of the free floating hydrocarbons already in the area and that contained in the skimmers' boom; however, prior to initiating decanting operations will confirm the location(s) proposed for this activity with the US Coast Guard (USCG) and verify with the current Operation Period's ICS-232 for Resources at Risk which may be present during the decanting operations and are potentially at risk of exposure.

Attachment: OSRV Specifications

CHAPTER 5 OIL SPILL RESPONSE EQUIPMENT

This chapter of the SIB deals with the recovered oil system and the thermal oil system and each of their respective subsystems and major components. The following sections are included:

- Recovered Oil System Piping
- Recovered Oil Transfer System and Pumps
- Recovered Oil Tankage
- Recovered Oil Heating System
- Oil/Water Separation
- Recovered Oil Debris Tank and Debris Compactor
- Oil Recovery System Control Consoles
- Support Boats

5.1 RECOVERED OIL SYSTEM FUNCTIONAL DESCRIPTION

The primary mission of this vessel is the recovery of oil from the water's surface. There are a variety of methods through which this vessel can accomplish this mission. The methods chosen for a particular mission depend upon the characteristics of the oil spill. These characteristics include the size of the spill, the thickness of the oil layer (and therefore the rate at which the oil will be recovered), the type of oil, and the viscosity of the spilled oil (viscosity is extremely temperature dependent). Additionally, the ship is equipped from time to time with various types of oil skimmers, each designed for different types of oil spills and recovery operations.

Generally, a skimmer will deliver an oil/water mixture to the recovered oil system. This fluid will be pumped to the recovered oil tanks depending on the trim condition of the vessel at the time. Filling only one port or starboard tank may result in an unacceptable list which could be hazardous to personnel during oil recovery operations. The oil/water mixture will then be processed by one of two primary methods discussed in the following subsections.

NOTE

Ship's personnel must take care during oil recovery operations to maintain the stability of the vessel. Dangerous free-surface conditions can result if too many tanks are partially filled during the recovery process. In general, filling more than two of the recovered oil tanks at a time should be avoided.

Decanted and separated water are discharged from the recovered oil system during recovery operations. Decanted water is water that has separated from the oil by natural process while in the recovered oil tanks. This water may contain oil in concentrations greater than 100 ppm but far less than that recovered by the skimmer.

Separated water has been processed by the oil/water separators and may contain from less than 15 to 100 ppm.

In extremely large spills, where it is important to collect large amounts of oil as quickly as possible, recovery operations may be facilitated by using only the "decanting" method to process the oil/water mixture (Method 1). During decanting, the oil will separate from the water and will float to the top of the recovered oil tank. Decanted water is pumped overboard in front of an active skimmer to make room in the recovered oil tanks for more oil/water mixture from the skimmers, the goal being to fill the cargo tanks with a mixture containing mostly oil. The oil/water separators are not used in this method due to the severity of the spill and the need for rapid recovery. Figure 5-1 shows a functional diagram of this method.

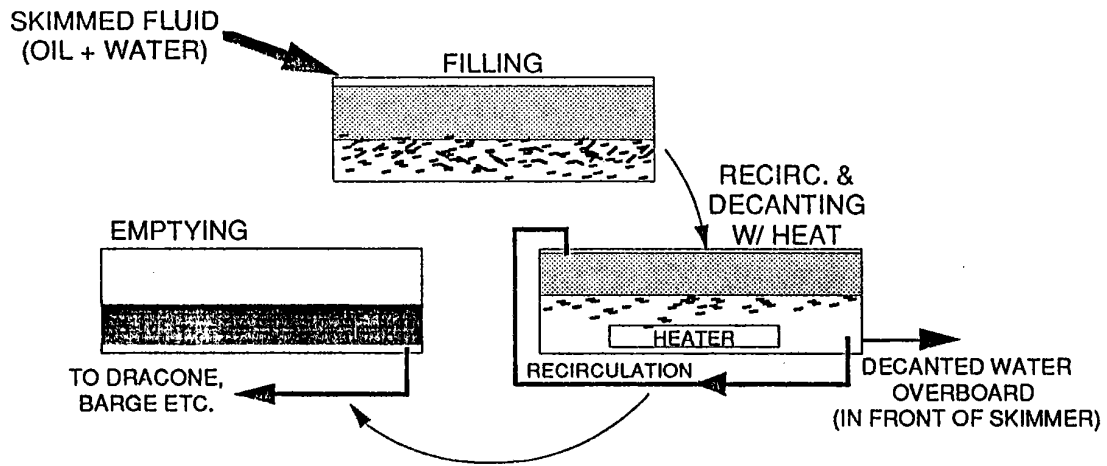
In recovery operations where the spill must be handled in a more thorough manner to remove all the oil from the water, the oil/water separators are used to thoroughly clean the water (Method 2). Refer to Figure 5-1 for a functional diagram of this method.

5.1.1 METHOD 1 - LARGE SPILL/EMERGENCY OPERATIONS

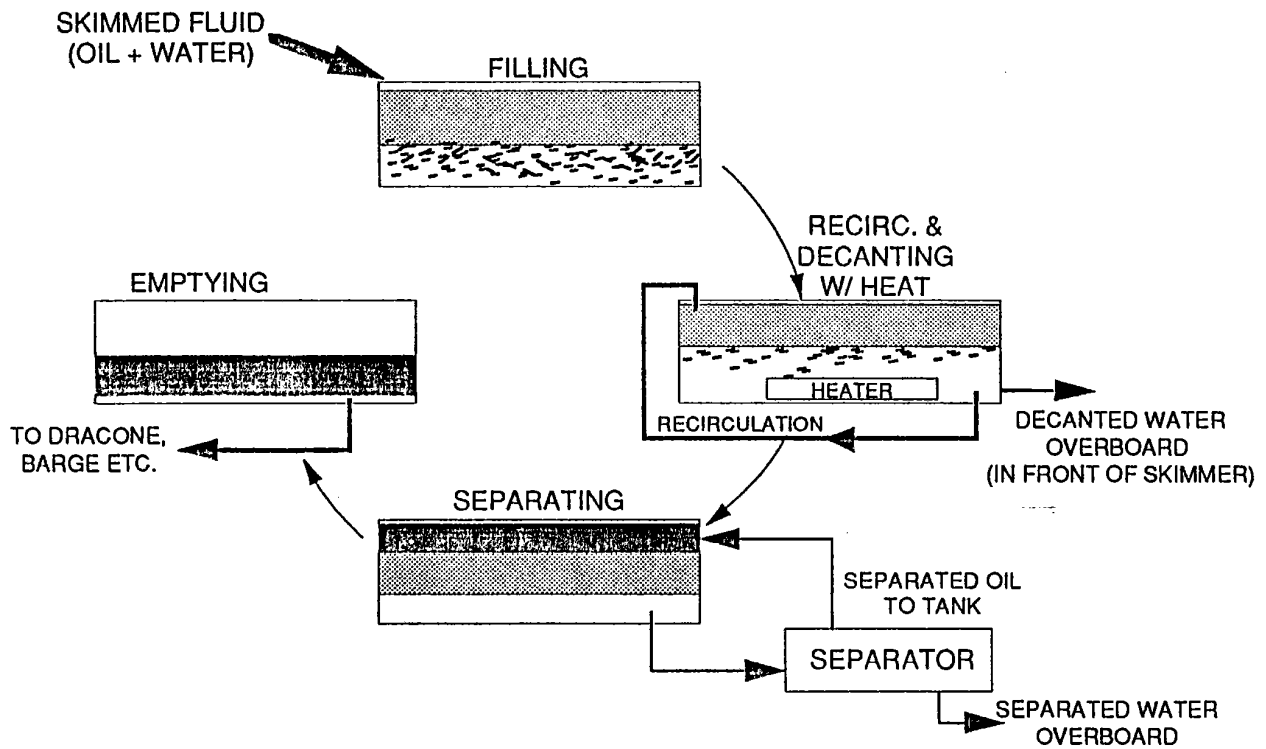
In extremely large spills where the oil layer is thick and sufficient equipment is unavailable to make a fast and complete recovery of the spilled oil, the largest amount of oil can be recovered by using the "decanting" process only.

Initially, the oil/water mixture from the skimmers will enter the recovered oil tanks. When the tank is full, the valve to another tank is opened and the valve to the full tank is closed. At this point, some separated oil will rise to the top of the tank since the specific gravity of oil is less than that of water.

Heating and recirculation can be used to further separate the oil from the water since heating decreases the viscosity of the fluid. The decision to heat the mixture may depend on the situation and the severity of the spill. Heating is especially important with viscous oils, but will generally increase the rate of oil/water separation in all oils. During heating, slow recirculation using the Framo oil transfer pumps (see Section 5.3) will provide even heating to the oil/water mixture and provide better separation results.



Method 1 Oil Separation without the Oil/Water Separator



Method 2. Oil Separation with the Oil/Water Separator

Figure 5-1. Oil Separation Methods

As the process continues, the water at the bottom of the tank will become relatively clean (decanted). The decanted water is discharged overboard in front of the skimmer during oil recovery operations. Any oil contained in the discharged decanted water will then be reprocessed by the system after being collected again by the skimmer. The decision to pump decanted water with oil concentrations higher than 100 ppm will depend on the situation. The water in the recovered oil tank should be decanted until the tank contents consist largely of oil. The remaining oil will eventually be pumped to a dracone, barge, etc for storage.

This method does not provide a complete cleanup of the surrounding waters but does allow large quantities of water or mixture to be rapidly processed during a large spill.

5.1.2 METHOD 2 - SMALL SPILL/NORMAL OPERATION

Oil recovery operations involving a small spill or a spill in protected waters may allow or require more complete oil removal from the water. The oil/water separator is used to remove the maximum amount of oil from the water as well as the maximum amount of water from the recovered oil tanks. The oil/water separator is discussed in Section 5.6.

The oil/water separator is used after the decanting procedure to process the remaining oil/water mixture from the bottom of the recovered oil tanks. The separated oil is returned to the recovered oil tanks while the clean water is discharged overboard. The separated water should have less than 15 ppm oil.

A small amount of decanted water will remain in the bottom of the recovered oil tanks even after the oil/water separator has stopped processing the mixture. The remaining contents of the tank are then pumped out to a dracone, barge, or other storage facility.

In the event oil/water separation is poor or low volume due to weather or other circumstances, the cargo tanks may be discharged to a shoreside facility for separation and disposal.

5.2 RECOVERED OIL SYSTEM PIPING

The recovered oil piping is arranged so that an oil/water mixture can be pumped directly from the oil recovery skimmers to the recovered oil tanks via one of the four inlet/discharge stations on the main deck. The system schematic is shown in Figure 4-13a. Recovered oil/water is routed through eight inch piping from the inlet/discharge stations, to a ten inch header pipe located in the alley way between the recovered oil tanks and running the length of the alley way to the oil/water separators. From the header pipe, the oil/water mixture is routed to any of the four recovered oil tanks via each tank's recovered oil inlet valve and eight inch piping. A ten-inch isolation valve (valve V07 on ships drawing P-22 and the system schematic shown in

Figure 4-13a) is installed on the header at frame 67 to isolate the inlet side of the header from the oil/water separators suction side. Figures 4-13a through 4-13d show the piping system layout for the recovered oil system and the recovered oil system schematic.

From the recovered oil tanks, decanted water can be pumped via each tank's Framo transfer pump over the side of the vessel. The decanting process is described in section 5.1 above and in the following sections of this chapter. The decanted water is routed via eight-inch piping to the ten-inch decanted water discharge header pipe in the forward part of the oil/water separator room at frame thirty three and directly over the side of the vessel through the overboard discharge outlet located on the port side of the hull at frame 36 as shown in Figure 4-13c. A crossover valve allows decanted water from the cargo tanks to be discharged through the separated water header and over the starboard side.

During skimming operations, the collected oil/water mixture can be routed from the skimmers directly to the oil/water separators by opening the V07 isolation valve described above, however ACS Industries, Inc., the manufacturer of the oil/water separators, discourages pumping directly from the skimmers to the separators. Rather, they recommend that the mixture be directed into the recovered oil tanks so that partial separation occurs through the decanting process prior to the mixture being routed to the separators.

After partial separation has occurred in the recovered oil tanks and decanted water has been pumped overboard, the remaining oil/water mixture is routed to both oil/water separators. The oil/water mixture is not pumped to the separators using the transfer pumps. Ordinarily this is an automatic process; the sensor probes in each recovered oil tank sense the oil/water interface and activate the separators. The probes deactivate the separators when the oil concentration gets too high, thus protecting the coalescer pads in the separators from being clogged with pure oil. Eight-inch suction lines run from each recovered oil tank to the suction side of the ten-inch oil/water separator suction header in the passageway between the tanks. Flow to the separators is induced by the suction of the oil/water separators oil and water pumps via the header and piping so as not to further mix the oil/water mixture prior to its reaching the separators. The mixture flows through the piping and suction header, through a duplex strainer on each of the separator units and into the first boot of each separator where the separation process begins. The separation process is described in following sections of this chapter.

From the separators, water is discharged via the water pump on each separator unit to a six inch discharge line which routes the water to the starboard side of the hull through the separated water overboard discharge manually operated skin valve at frame 34 as shown in Figure 4-13b.

Separated oil is pumped via each separator's oil pump to an eight inch separated oil discharge header which routes separated oil either back to one or more of the recovered oil tanks or up to the port forward inlet/discharge station manifold through the valve V08 as shown in Figure 4-13d.

Each recovered oil tank contains a Framo SD-125 submersible hydraulic motor driven cutter pump which can either recirculate the oil/water mixture during heating operations, transfer the contents of one tank to another, or pump the contents of any tank to storage units via eight-inch piping to the main deck inlet/discharge stations. The transfer pump recirculation line returns recirculated oil/water mixture to the top of the tank away from the suction in the opposite corner of the tank to reduce mixing during heating and recirculating operations.

The recovered oil piping is flushed-out using the ballast system. An isolation valve is located in the alley way at frame 66 which connects the ballast system with the crossover piping of the main deck inlet/discharge stations. Flushed water is collected in the recovered oil tanks, then processed with the oil/water separators or pumped to a collector.

All piping bends in the recovered oil piping are kept to a minimum. Branch fittings are the "Y" type. No standard tees or check valves are used. Where possible, flow is from one source only. When flow from two or more sources could occur, ten-inch piping is used. Flanged takedown joints are provided in the system. The inlet/discharge piping is sized with as few bends as possible to prevent debris from clogging the pipes. The following sections describe the various components and systems of the ship's inherent spill response equipment.

5.3 RECOVERED OIL TRANSFER SYSTEM AND PUMPS

5.3.1 RECOVERED OIL TRANSFER SYSTEM

Ordinarily, a recovered oil/water mixture is pumped from the various skimmers, through one or more of the inlet/discharge stations located on the vessel's main deck, to one or more of the recovered oil tanks. Most of the skimmers have pumps, powered by the ship's central hydraulic system, for pumping the collected oil/water mixture aboard the ship.

Many skimmers have screening grates installed for filtering out larger sized debris. The recovered oil piping of the vessel is large enough to handle smaller debris that makes it past the skimmer grating. Two large filters on each oil/water separator filter out debris that makes it to the separators that could clog the coalescer pads in the units.

A suction is taken from the bottom of the recovered oil tanks by the oil and water pumps of the oil/water separators. The oil and water pumps are on the discharge side of the separator. The oil/water separator is on the suction side of the water pump and the oil pump. The flow to the oil/water separators is induced by suction in order to avoid mixing of the oil and water by the pumps into a stable emulsion.

From the separator, separated oil is pumped to a recovered oil tank, a towable storage bladder, or to a waiting barge, tanker, or shore station. Separated water is pumped overboard by the water pump through a six-inch line that includes a sample port. Skin valves, operated mechanically from the main deck through reach rods, isolate the overboard discharge of water.

Each recovered oil tank has a recovered oil transfer pump installed. These transfer pumps are described in Section 5.3.2 below. The Framo SD-125 submersible transfer pumps are driven by the ship's central hydraulic system and are used to empty the recovered oil tanks of their contents by pumping to a dracone, barge, tanker, or ashore. The pumps are not used when routing an oil/water mixture to the separators in order to prevent additional mixing of the oil/water mixture. The transfer pumps are also used to recirculate the oil/water mixture during heating by the recovered oil heater unit. This mixing action accelerates the decanting of water from the mixture in the recovered oil tanks.

Valves for the transfer functions are for the most part, electrically operated butterfly valves controlled from one of two consoles.

5.3.2 RECOVERED OIL SUBMERSIBLE TRANSFER PUMP

5.3.2.1 Transfer Pump, General

Each recovered oil tank has a Framo Model SD-125 deep well transfer pump installed for handling the contents of the recovered oil tanks. The centrifugal pump is located inside each tank. The pumps are powered by the ship's central hydraulic system. The pump motor and controls are mounted outside the tank. They are capable of cutting debris to limit obstruction from debris in the piping system. Each pump is capable of producing 1400 gpm at 65 feet of head when the hydraulic pump pressure is 4,000 psi.

Each pump discharges via dedicated piping to either the port or starboard forward inlet/discharge manifolds. The pumps in the port recovered oil tanks pump to the port forward main deck inlet/discharge manifold and the pumps in the starboard recovered oil tanks pump to the starboard forward main deck inlet/discharge stations. The contents can then be routed to any of the other inlet/discharge stations via the inlet/discharge crossover piping.

Each pump can be lined up with the ten inch decanted water discharge header which routes the decanted water to an opening located on the port side of the vessel at frame 35, forward of any deployed oil booms as shown in Figure 4-13c; or, through a crossover valve, to the starboard side.

Each pump can be lined up for recirculation from the tank, through the pump, and back to the tank through recirculation piping. Recirculation of an oil/water mixture is used when the recovered oil heating unit is on line to heat the mixture in that tank. The recirculation speeds the heating process.

Each pump can be lined up to any other recovered oil tank via the forward main deck inlet/discharge manifolds and the crossover piping.

Each pump consists of two main parts: the pump and pipe stack inside the tank and the top cover plate with flow control valve and all external pipe connections outside the tank.

5.3.2.2 Transfer Pump Specifications

Number of pumps:	4
Material cargo side:	AISI 316 L
Hydraulic motor:	A2FM80
Cargo sp. gravity - viscosity:	1.025 - 1.0
Capacity @ head :	1400 gpm @ 65' head
Motor speed:	2300 rpm
Oil consumption:	192 liter/min
Hydraulic pressure:	261 bar (3780 psi)
Hydraulic oils meeting Framo	
General specification:	1400-069-4 (see Chapter Eight in Framo technical manual included in the ship's set of technical manuals)

5.3.2.3 Transfer Pump Control

The pump revolutions can be controlled in 10% steps from zero to max rpms from the remote control panels described in Section 5.8 of this chapter and locally at the flow control valve on the pump top cover plate. The remote control panels are shown in Figures 5-4 and 5-5 in Section 5.8 of this chapter.

5.4 RECOVERED OIL TANKAGE

5.4.1 RECOVERED OIL TANKS, GENERAL

The inboard and after tank sides of the recovered oil storage tanks are constructed with corrugated bulkheads to provide smooth surfaces for cleaning while retaining the necessary stiffness and strength. The tanks are fitted with tank heating coils and a tank level indicating system for sounding all recovered oil tanks and monitoring temperature. The heating coils are described in following sections. Each tank is fitted with a deep well pump (as described above) for emptying the tank or recirculating the oil/water mixture during heating operations.

5.4.2 RECOVERED OIL TANK CAPACITIES

#1 Recovered oil (port and stbd)	89,474 Gal	
#2 Recovered oil (port and stbd)	83,882 Gal	Total 173,356 Gal

5.5 RECOVERED OIL HEATING

5.5.1 RECOVERED OIL HEATING SYSTEM GENERAL

The recovered oil heating system is installed to accelerate the decanting process of the recovered oil-water mixture, assist in separating emulsions, and assist in pumping oils with greater viscosities. A First Thermal heater unit is installed in the oil heater room on the 01 Level of the vessel. The thermal fluid, Therminol 55, is heated and pumped through piping to the recovered oil tanks. Individual parallel branches of piping route the thermal fluid through VICARB heating coils installed in each tank to transfer heat to the oil-water mixture contained within. The piping includes power operated butterfly valves installed at the inlet, and check valves installed at the outlet of each tank.

From the recovered oil tanks, the Therminol 55 is routed to an expansion tank. The expansion tank allows the thermal fluid to expand and permits any moisture accumulated in the thermal fluid to escape the system through the vent located on top of the expansion tank.

From the expansion tank, the thermal fluid goes back to the circulation pump installed on the side of the heater unit. The pump circulates the fluid back into the heater, past the heater coils, where the fluid is reheated for another cycle.

The system is controlled by a liquid temperature controller which measures the thermal liquid temperature at the outlet of the heater. A differential pressure limit switch is provided for use as a safety device to provide continuous liquid flow through the heater.

More detailed operation, maintenance, installation, and troubleshooting instructions can be found in the First Thermal Systems, Inc. instruction manual for the 600X-(2)4-(2)3-MHEHC-NA-OL-UL-CG-ABS heater included in the ship's set of equipment technical manuals on each vessel.

The following general cautions and minimum maintenance requirements for the First Thermal oil heating system are included in the instruction manual for the heater unit. They are listed here for emphasis but are not all inclusive. Operators of the oil heating system should read and understand the First Thermal Systems's Instruction Manual prior to operation of the unit.

CAUTION

Do not exceed the design burner input.

Do not operate the thermal fluid heater with low or no flow through the heater coil.

Do not operate the thermal fluid heater at a higher temperature than design operating temperature.

Correct any thermal fluid leak immediately: it is a fire hazard.

All operating and limit controls must be checked at frequent intervals to ensure the proper working condition and to prove that each is set at the correct range.

Any combustion leak should be corrected immediately, as structural damage to the heater shell and/or end plates could occur due to overheating.

Keep objects away from the combustion air blower's intake. Objects such as cardboard, rags, etc. can block air flow if the suction airflow pulls these items to the blower's intake.

Do not add fluid to an operating system when the system fluid is above 212° F., unless the fluid to be added is known to be completely free of water. Add only when the entire system is below 212° F (See system dry out instructions).

Never operate the thermal fluid heater system by blocking, jumping, and/or rendering any operating or interlock device inoperative. If a device is defective, repair or replace it, and recalibrate the system if required.

Do not allow oil or other flammable materials to be stored near the heater unit.

5.5.1.1 Recovered Oil Heater Characteristics

The heater unit for the system is a First Thermal Systems Inc., (Model 600X-(2)4-(2)3-MHEHC) diesel fuel fired, liquid tube heater rated at 12 million BTU per hour (See Table 5-1). The unit is skid mounted and installed in the oil heater room, located on the 01 Level. A dedicated day tank is installed in the immediate vicinity of the heater unit for fuel supply to the heater.

The heater unit's components consist of a single, North American Model 5514-9 Fire-All #2 Oil Burner, a North American Model 2420-F-T25D Combustion Air Blower powered by a 25 HP, 3600 RPM, electric motor, a Dean Brothers Model DL230 inline Circulating Pump for the thermal oil, a Viking Model FH 32 Fuel Oil Pump, and the various motor starter enclosures, control panels, control valves, and inlet/outlet piping.

Table 5-1. First Thermal Heater Characteristics

FEATURE	CHARACTERISTIC
Construction	Per ASME Code Section 1 (P3 Data Report Furnished)
Heating Media	Therminol 55
Design Duty	12 Million BTU/HR
Operating Temperature	OUTLET: 370° F.
Fuel Type	#2 Fuel Oil
Relief Valve Setting	150 psi
Dry Weight	19,620 lbs.
Design	150 psig @ 550° F.
Flow Rate	520 gpm
Fuel Input	14.00 (m.m. BTU/HR)
Operating Temp. @ Inlet	270° F.
Heating Surface	1116 sq. ft.
Coil Capacity (Gals)	553
Operating weight	24,300 (approx.)

The North American Fire-All Oil Burner is a rugged, maintenance free, sealed-in burner for burning diesel fuel in this heater application. The burner includes tile, a mounting plate, Sensitrol Oil Valve, and an observation port into which a small amount of atomizing air is introduced to keep the glass clear. Additionally, the outer housing is equipped with an atomizing air connection, a main air connection, and a fixture for mounting a Honeywell Model C7035 Minipeeper Ultraviolet Flame Detector.

5.5.1.2 Expansion Tank Characteristics

An expansion tank is installed above the recovered oil heater room. The expansion tank's capacity is such that the fluid level in the tank is 1/4 to 1/3 full when the system is cold and 1/2 to 2/3 full when the system is hot. The top of the tank has a vent installed to allow any moisture trapped in the thermal oil lines to be vented out as steam during system start-up only. Correct start-up procedures require several hours of circulation of the Therminol 55 at increasingly higher temperatures to allow any moisture in the thermal oil lines to flash to steam in the expansion tank and be vented out the top of the tank. The expansion tank is a cylindrical structure with a sight glass, fluid level gauge installed on the side to visually indicate fluid level in the tank at all times. The expansion tank, after all moisture in the system has been vented, is sealed with a pressurized nitrogen blanket. The nitrogen cylinder and all associated equipment are located in the space with the expansion tank. The nitrogen blanket is required to prevent oxygen intrusion into the fluid. This is necessary for two reasons: there is a possible fire hazard presented by the Therminol 55 when it is at high temperature, and the presence of oxygen in the fluid would lead to oxidation sludging. More information is available in the First Thermal manuals, and the Therminol 55 Material Data Sheet.

5.5.1.3 Recovered Oil Tank Coil Bank Heat Exchanger

Each recovered oil tank has a set of VICARB Coil Bank Heaters installed for heating the recovered oil-water mixture to speed up the separation process and facilitate pumping of cold and/or viscous oils throughout the system. The heater banks are designed to be disassembled in components for removal from the recovered oil tanks through a 24" x 24" square manhole hatch. The banks are constructed of 10 gauge material, and are bolted together to a manifold using 6" 300 psi flanges. The banks are designed to transfer 12,000,000 BTU/HR to sea water with water being recirculated at 1,400 gpm. They are able to heat a 50/50 mixture of #6 black oil-seawater and transfer 7,500,000 BTU/HR and also be able to heat 50/50 oil-water mixture with oil viscosity of 20,000 centistoke. The banks are constructed with adequate strength for personnel to walk on top of the banks for cleaning purposes. The banks require little in the way of maintenance. It is recommended that the banks be flushed with fresh water and coated with a light oil after they have been used in salt water.

5.6 OIL/WATER SEPARATION

5.6.1 PRECAUTIONARY NOTICES

There are several precautionary notices in the ACS Industries, Inc. Oil/Water Separator Owners Manual. They appear in bold print using capital letters. These can be of a safety nature or intended to prevent equipment damage. Similar notices appear in the component manufacturers' literature. Those instructions must be strictly followed to prevent system damage and personnel injury.

The following subsections of this SIB contain descriptions of major components of the separator and general operational procedures. Operators of this equipment are cautioned that the procedures and cautions included in the SIB are not all inclusive. The operators must read and understand the owners manual and the component manufacturers literature before attempting to operate the oil/water separator equipment. If any operation described herein and in the owners manual is thought to present a potential hazard, it should be brought to the attention of MSRC safety and engineering personnel immediately for resolution.

5.6.2 OIL/WATER SEPARATOR, GENERAL SYSTEM DESCRIPTION

The two oil/water separators are nearly identical skid mounted units. They can be used at the same time, or independently. Each of the two oil/water separators is designed to handle a total of 115 cubic meters per hour of oily water (approximately 525 gallons per minute). The discharge water will contain less than 100 ppm of oil when the unit is operated in accordance with operating instructions, as contained in the ACS Industries, Inc. Oil/Water Separator Owners Manual. The unit is capable of oil/water separation of oil up to 20,000 centistokes, with 50% water. However, the oil/water mixture must be such that the units can operate according to Stokes Law. Namely, the specific gravity of the oil should be less than 0.99, particle size should be greater than three microns and oil should not have a soluble portion in excess of ten ppm.

The units can not separate water or oil from an oil/water emulsion. If an emulsion is present, other means of treatment must be employed (i.e. heat, chemicals, etc.). An oil/water emulsion is the result of the two fluids coming together but not dissolving into each other. One is dispersed as drops into the other. There are different types of emulsions, caused by different conditions. In general, emulsions result in higher density and higher viscosities, both of which are detrimental to recovery and separation operations.

The oil/water separator essentially consists of three stages or "boots" in two main chambers as shown in Figure 5-2. The unit operates as a series of coalescers. In each boot, a coalescer pad

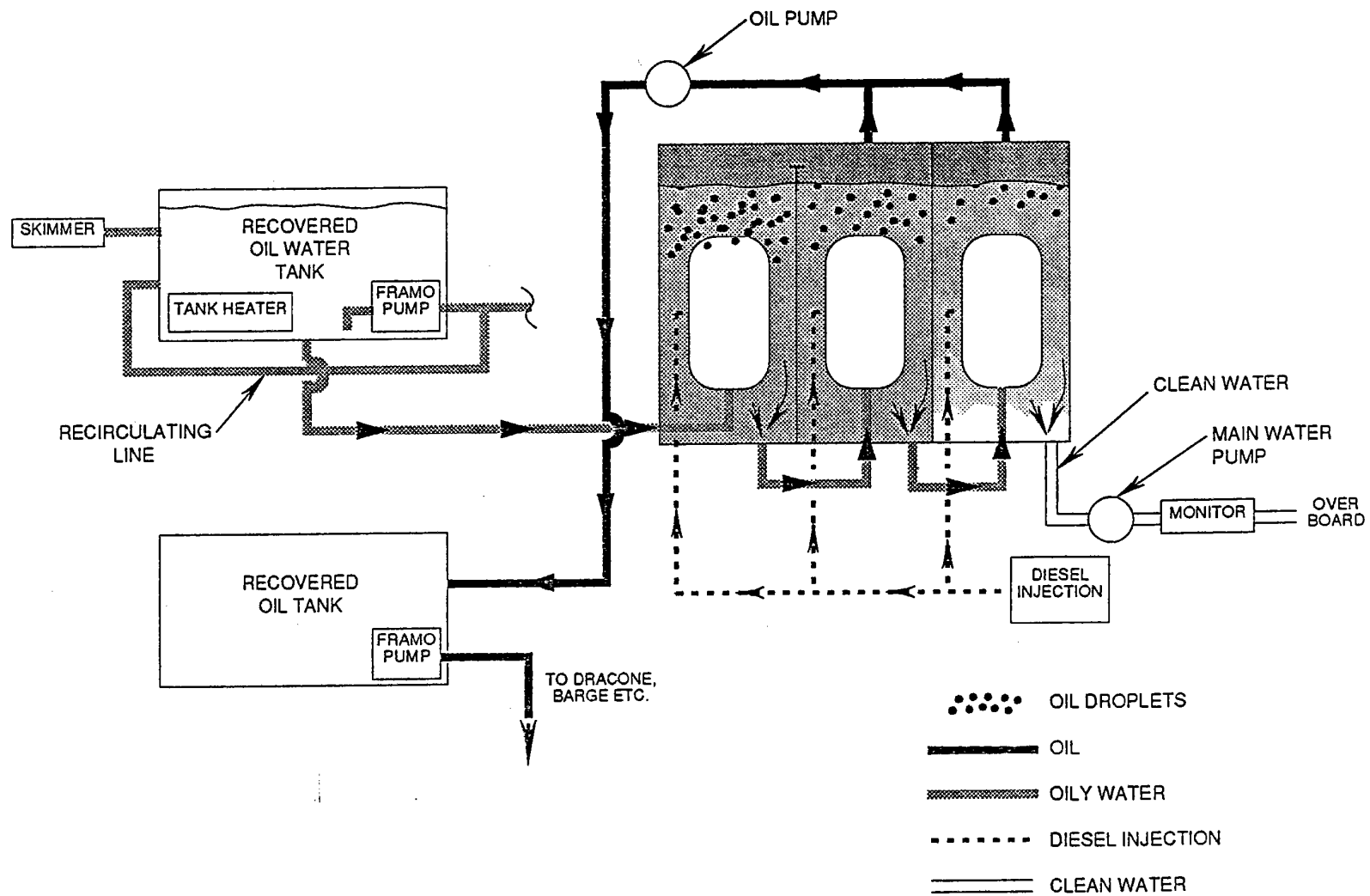


Figure 5-2. Oily Water Separator Functional Diagram

causes small oil droplets to coalesce into larger droplets which quickly separate from the mixture and rise to the top of the unit. The mixture initially flows into the first boot where stainless steel baffles begin the coalescing process. As the mixture flows from the first boot to the second boot, the coalesced oil rises to the top of the second boot where it is pumped out. The first two boots make up the first chamber of the separator. The majority of separation is accomplished in this chamber. From the second boot, the mixture flows through a fiberglass mesh coalescer pad into the second chamber and third boot. Again the coalesced oil droplets rise to the top of the boot and are pumped out. The remaining water in the chamber flows through a third coalescer pad where any remaining oil droplets are coalesced and rise to the top of the chamber. A water pump takes a suction from under this third pad, pumping the now clear water overboard. An oil pump is connected to the tops of both the second and third boot to pump the oil from the separator back to a recovered oil tank, storage dracone, barge, or tanker.

The oil/water separator's coalescer chambers are on the suction side of the water pump and the oil pump. The flow to the oil/water separators is induced by suction in order to avoid mixing of the oil and water into a stable emulsion.

5.6.3 OIL/WATER SEPARATOR FUNCTIONAL DESCRIPTION

On each of the control panels of the oil/water separators, one of the oil storage tanks must be selected for treatment. Each oil/water separator must be set to treat the same recovered oil tank. The selected recovered oil tank valve must be electrically opened, and it must remain open during the course of treatment. After a tank has been selected, signals from the interface probes in the selected recovered oil tank will activate the oil/water separator if the top probe senses water or place the separators in stand-by when the bottom probe senses oil. Two probes are used in parallel, so that if one fails, the other will operate the unit.

NOTE

ACS Industries does not recommend or condone operating the oil/water separator directly from the skimmer. Operating the units in this mode can easily result in over pressurizing the units and "popping" the 2" x 3" pressure relief valve. Also, the coalescer pads are at risk to be fouled with oil, which may mean premature cleaning. The unit was designed to operate in the automatic mode with a minimum of operator attention, on the partially separated water/oil mixture from the recovered oil tanks.

If the skimmer option is selected (pumping directly from the skimmers to the separators), with the oil/water separators in automatic, the oil/water separators will operate as if an oil/water mixture is present in the storage tank header. ACS does not recommend nor condone operating directly from the skimmer.

Figures 4-13b, 4-13c, and 4-13d show the location of the separator units and the flow of oil/water mixture to and from each. Figure 5-3 shows the oil/water separator schematic. Refer to these figures while reading the following system description paragraphs.

The oil/water mixture flows from the selected tank through the selected tank's suction valve, through the ten-inch header pipe, and to the vicinity of the oil/water separator. There the header splits and sends the mixture through individual eight-inch lines from the forward end of the supply header to each oil/water separator where the pipe is connected to the unit. Control valve #1 is on the oil/water inlet to the separator. This valve is closed when the unit is not operating, and it acts as the positive shutoff. The valve is wide open when the unit is in operation. The control valve is followed by a check valve to prevent backflow from either unit into the common header, as both oil/water separator units will normally be operating together.

Next, the oil/water mixture flows through two parallel filters. ACS recommends that both filters always be operated. There is a differential pressure gauge across the filters. When the differential pressure exceeds three psi, the filters should be cleaned. A differential pressure of three psi will trigger an alarm, but the unit will continue to operate.

From the filters, the eight-inch lines recombine and the mixture flows to boot #1. The first boot is internally baffled and begins the oil/water separation process. The separating mix flows through this first coalescer, which consists of stainless steel parallel plates. The majority of the oil is coalesced here and rises to the top of the second boot. The oil from the top of the second boot is pumped out through an eight-inch cast iron check valve, #33, and pumped back into a selected storage tank, dracones, barge, tanker, or shore station.

This second boot is equipped with three pairs of Drexelbrook interface probes especially designed for this application. The operation of these probes is critical to the operation of the entire separator. In general, the probes detect the level of oil in the top of each boot and direct the oil pump, or the water pump, or both to turn on depending on the level of oil or water in the top of the boot.

After the second boot, the partially separated oil/water mix flows through a twenty four inch thick by five-inch wide by forty-eight inch high co-woven fiberglass/304 stainless steel coalescer pad into the second chamber and the third boot of the unit. As the mixture flows into the chamber, it flows up over a partition and the oil droplets rise to the top of boot #3. The operation of boot #3 is similar to the operation of boot #2. Probes are installed at the top of

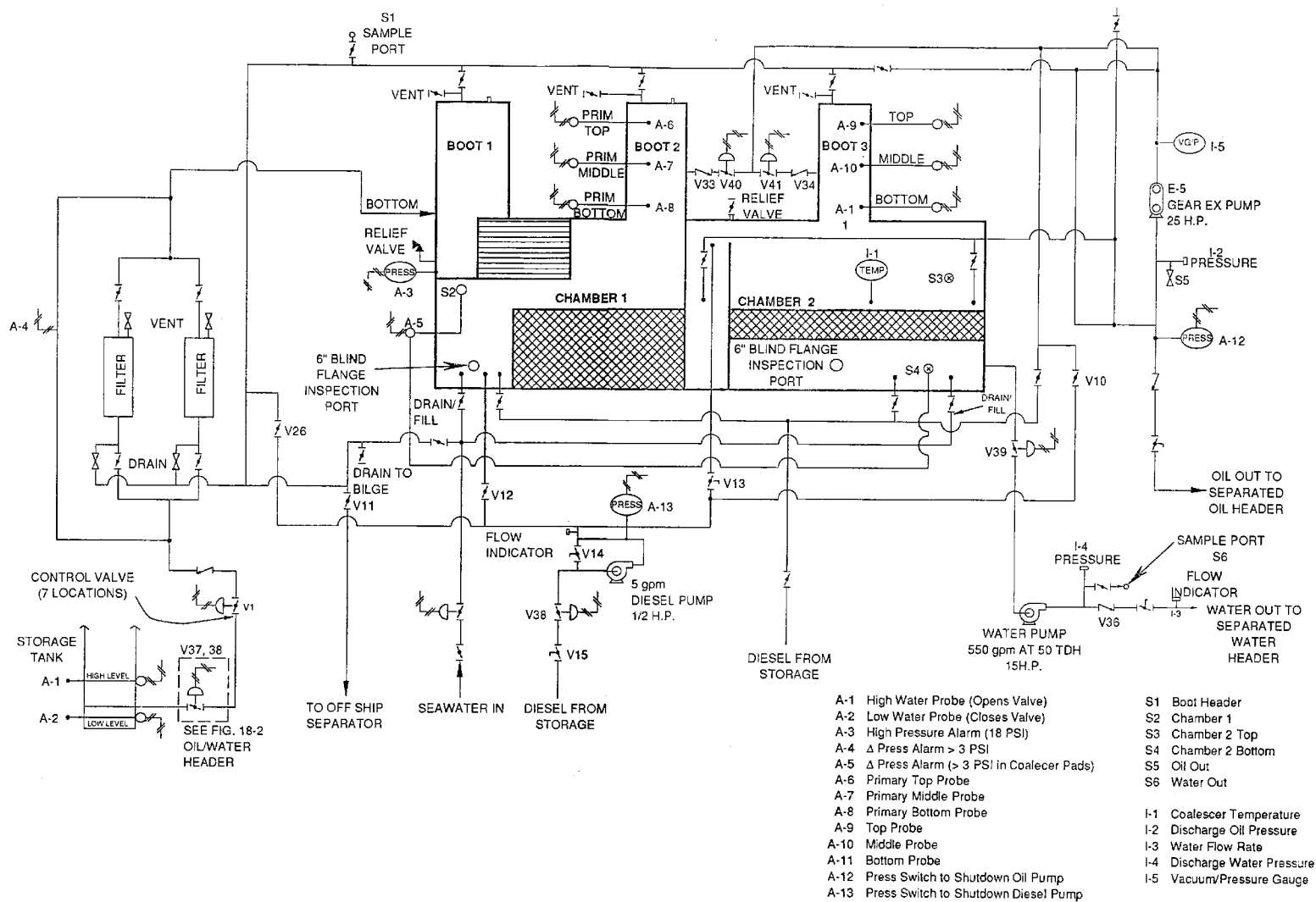


Figure 5-3. Oil/Water Separator Schematic

the boot that detect the level of oil and direct either the oil pump, water pump, or both to turn on. The oil at the top of the third boot is pumped through an eight-inch cast iron check valve (#34) identical to the valve from the second boot described above. The check valves are necessary because both boots are connected to a common oil suction header. The check valves prevent cross flow between the boots.

The water left in the second chamber then passes through a horizontal coalescer pad. Oil coalesced in this pad floats to the top of the second chamber (third boot) and is collected and pumped out as described above. A 15 hp water pump pulls the water from the bottom of the second chamber, beneath the third coalescing pad, via a six-inch line at a maximum rate of up to 525 gpm. The pump discharges into a six-inch line equipped with a pressure gauge and sample port. The water flows through check valve, #36, a flow indicator, and a skin valve before discharging overboard.

5.6.4 OIL/WATER SEPARATOR INDICATORS AND CONTROLS

5.6.4.1 Oil/Water Separator Indicators and Controls, General

The ACS oil/water separators are designed to be operated primarily in the automatic mode on the partially separated oil/water mixture from one of the recovered oil tanks. In order to minimize fouling, sensors are used in the recovered oil storage tanks to allow only oily water to enter the separators. In addition, if the oil is above 2,000 centistokes viscosity, it is recommended that the diesel injection system be used in the mode that will allow it to operate automatically with the water pump. This allows the system to deliver water for discharge which is less than 100 ppm oil and in most cases, less than 15 ppm. The 15 ppm is the U.S. Coast Guard standard for water discharge during normal operations.

The separator can be manually operated at any time, or automatically operated, based upon the water level(s) in the oil storage tanks and control panel settings.

CAUTION

Operation of the units in the manual mode is not recommended due to the possibility of fouling the coalescer pads. If the unit is operated in the manual mode it must be done with extreme caution. The unit has the capability of being lined up directly to the skimmers, however, the manufacturer of the separator does not recommend this.

5.6.4.2 Oil/Water Separator Control Panel

Control of the oil/water separators is derived from a programmable logic computer (PLC). This computer operates the system when on "Automatic" based on signals received from the Drexelbrook oil level sensors located in the recovered oil storage tanks and in the tops of boot # 2 and #3. The sensors indicate the oil/water separation level in both the storage tanks and the tops of the boots. When the sensors indicate that the amount of oil collected in the top of either boot is sufficient, they activate the appropriate valves and pumps, enabling the oil to be pumped out. In the oil storage tanks, the sensors detect the oil/water separation level and activate the oil/water separators automatically if the units are in the "Automatic" mode.

5.6.4.3 Oil/Water Separator Functional Indicators and Alarms

On the face of the oil/water separator control panel, there is a schematic flow diagram. The functional indicators work in both the "Automatic" or "Manual" modes. The following subsections list the systems functional indicators and alarms. These subsections reference valve numbers on the oil/water separator schematic Figure 5-3.

5.6.4.3.1 Oil/Water Separator Functional Indicators.

Boot #2 Primary Probes-	The indicator lights are lit when water is present in the boots. If the lights are off, the boots are full of oil or air.
Oil Gear Pump-	When this pump is on the indicator light is on.
Sea Water-In Valve-	This valve is opened and closed manually. When the valve is open, the light is on.
Water Valve-	When this valve is open, the light is on. It opens automatically when the water pump turns on in the automatic mode.
Water Pump-	When this pump is on, the light is on.
Diesel Fuel Valve-	When this valve is open, the light is on. It opens automatically when the diesel pump turns on.
Diesel Fuel Pump-	When this pump is on, the light is on.